EXHIBIT C

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

SALVATORE GITTO AND PHYLLIS GITTO, Plaintiffs, vs. A.W. CHESTERTON CO., INC., *et al.*, Defendants.	)	Civil Action No. 07 CV 4771 (DC)

SUPPLEMENTAL DECLARATION OF ARTHUR F. WARDWELL

I, Arthur F. Wardwell, declare the following:

1. This declaration supplements my previous declaration in the above litigation, dated June 4, 2007, and is made in support of the Opposition to Plaintiffs' Motion to Remand by Eaton Hydraulic Inc., formerly known as Vickers, Incorporated ("EHI"). Also attached as Exhibit 1 is a true and correct copy of my Curriculum Vitae ("CV").

2. As mentioned in my earlier declaration, I understand that Plaintiff Salvatore Gitto alleges injury as a result of exposure to asbestos and asbestos-containing products aboard certain Naval vessels at the Brooklyn Navy Yard in the 1950s and 1960s. Based on my twenty-four years of service in the U.S. Navy,[1] as outlined in my previous declaration and provided in my attached CV, I can attest to the level of direction, supervision, and control exercised by the Navy over the design, manufacture, and maintenance of equipment aboard Navy vessels, as well as the

[1] In my previous declaration, I explained that I served in the Navy between 1958 and 1982, but incorrectly noted that this was a twenty-seven year period. As noted above, my Navy service was over a twenty-four year period.

provision of any warnings, labels, or caution statements for equipment installed aboard such Navy vessels.

3. Specifically, through my various positions in the Navy, I have personal knowledge of all aspects of products installed on Navy vessels in the 1950s and 1960s, particularly warnings for such products. All products supplied for these Navy vessels, including pumps and valves manufactured by EHI, were manufactured in accordance with reasonably precise Navy specifications, and were reviewed and approved by the Navy at EHI's plant and at the shipbuilding yards. In addition, any EHI products used on these Navy vessels conformed to the Navy specifications.

4. As discussed in my previous declaration, the Secretary of the Navy, or his delegees, including Naval Sea Systems Command ("NAVSEA") and the specific Contracting Officers, exclusively developed the ship designs and plans, as well as comprehensive and detailed regulations and specifications for all shipboard equipment, and such Navy officers supervised, enforced, and approved compliance with these Navy plans, regulations, and specifications by contractors such as EHI. All contracts for products installed on Navy vessels were "rated" contracts entered into pursuant to 50 U.S.C. § 2061-2171.

5. All aspects of the design performance requirements and materials for construction, including thermal insulation, of any pumps or valves supplied by EHI to the Navy for installation on U.S. Navy vessels in the 1950s and 1960s were specified by the Secretary of the Navy or his delegees. Such Navy specifications prescribed the use of asbestos-containing insulation for products. If asbestos was in any EHI pumps or valves during this time, it was prescribed explicitly by the Navy through such Navy specifications, and EHI could not unilaterally change or omit asbestos. Furthermore, to my knowledge, at all times, EHI apprised the military of any concerns of which it had actual knowledge relating to such pumps and valves.

6. Attached as Exhibit 2 is an example of a military specification requiring the use of asbestos products as thermal insulation material. *See* Ex. 2 (MIL-STD-769B (SHIPS), *Thermal Insulation Requirements for Machinery and Piping*, dated 3 January 1966).

7. The U.S. Navy had precise specifications as to the nature of any communications affixed to equipment supplied by EHI to the Navy. EHI would not have been permitted, under the detailed Navy specifications, associated regulations, and procedures in the 1950s and 1960s, to affix any type of warnings, including any warnings regarding asbestos hazards, to EHI pumps or valves installed on U.S. Navy vessels, other than those required by the Navy. EHI could not unilaterally change any warnings, markings, or labels, including those regarding asbestos hazards, affixed to or accompanying EHI pumps or valves, required by the Navy for any such equipment. *See* Ex. 3 (MIL-STD-755, *Labels Containing Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials*, dated 31 August 1961).

8. Also attached as Exhibit 4 is military standard, MIL-M-15071D (SHIPS), dated 6 June 1961, governing the Navy's requirements for all technical manuals for shipboard electrical and mechanical equipment, including any pumps or valves installed on Navy vessels. This specification demonstrates that the Navy had final approval over all such technical manuals and that any warning, label, or other caution statement on equipment installed on Navy vessels was explicitly prescribed or proscribed by the Navy through, among other things, its review and approval of these technical manuals.

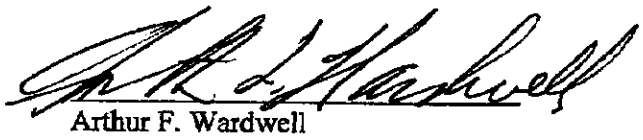
9. Specifically, MIL-M-15071D, paragraphs 3.1.1, 3.1.2, and 3.5.2, all prescribe the Navy's approval of such manuals, both Class A and Class B manuals. Paragraph 3.1.1 states that "[a]pproval of a class A manual will be by the Bureau of Ships only and, once approved, the basic manual shall not be modified without the approval of the Bureau of Ships." Similarly, paragraph 3.1.2 requires that "[o]nce a class B manual has been approved by the Bureau or its field representative, the manual shall not be modified without approval of the Bureau of Ships." Paragraph 3.5.2 also mandates that "[f]our copies of each revision shall be submitted to the Bureau for approval and assignment of a change number." As such, any suggestion that EHI could deviate in any way from the warnings, labels, or caution statements prescribed and proscribed by the Navy is incorrect. Contractors such as EHI could not place any warnings in

such technical manuals unless they were explicitly reviewed and approved by the U.S. Navy, nor could they make any modifications to such manuals without the Navy's explicit direction.

10. Attached as Exhibit 5 is an EHI technical manual for a variable delivery piston pump, Model No. PVV-5020-FC-1-20-B, dated April 1963. This technical manual was approved by the Chief, U.S. Bureau of Ships, and was supplied by EHI to the U.S. Navy in accordance with Contract No. 86916, dated July 6, 1962. This exemplar technical manual shows that any pumps or valves supplied by EHI for installation on any Navy ships were in accordance with specific contracts between EHI and the Navy. Through such contracts, the U.S. Navy directed contractors such as EHI to include specific warnings on any of their products installed on such Navy ships, and prevented them from including any warnings beyond those required by the Navy.

11. In short, the Navy was intimately involved with and had final approval over all technical manuals, safety or hazard information, and all other written information that accompanied equipment installed on Navy vessels in the 1950s and 1960s, including any EHI pumps and valves. The Navy dictated all aspects of the warnings associated with equipment installed on its ships and did not permit any deviation in those warnings from contractors such as EHI. As such, any warnings regarding asbestos hazards were explicitly prescribed and proscribed by the U.S. Navy and manufacturers such as EHI could not deviate to comply with any state-law imposed warnings. The Navy knew in the 1950s and 1960s that there were no warnings regarding asbestos hazards accompanying products installed on Navy vessels. If a contractor such as EHI had unilaterally attempted to add such warnings, it would have been prohibited and proscribed from doing so.

I declare under penalty of perjury that the foregoing is true and correct.



Arthur F. Wardwell

Dated: July 3, 2007

EXHIBIT 1

ARTHUR F. WARDWELL

EXPERIENCE AND QUALIFICATIONS:

1995- 1999. Mr. Wardwell joined American Management Systems Corporation August 1995. He was immediately assigned to the Avondale Shipyard LPD-17 Shipbuilding Proposal team as lead project Engineer for the Production, Scheduling and Quality Assurance portions of the proposal. He remained full time at the Avondale site for the entire project development, submittal and best and final support, August 1995 through November 1996, and on an call/technical support basis until contract award.
1997 until present Mr. Wardwell remained a part time employee of American Management Systems and a self-employed private consultant providing marketing and support services to numerous start-up and small businesses, including Mexican Maquiladora firms.

1982-1994. Mr. Wardwell joined Continental Maritime Inc. (CMI) in 1982 as General Manager of Continental Maritime of San Diego Inc (CMSD).
In 1984 he was promoted to CMI Vice President of Operations, with oversight responsibility at both Continental Maritime of San Francisco, Inc. (CMSF) and CMSD. Following Service Engineering Industries (SEI) purchase of CMI in 1990, he assumed the position of SEI Vice President of Operations. Mr. Wardwell has been a Director and officer of the San Diego Ship Repair Association (SDSRA) since its inception in 1982. He served as Vice President from 1982 to 1990, and as President from 1990 to 1993. He served as a member of the Board of Directors for the National Shipbuilding Council of America (SCA) from 1986 to 1994. As an active Director he served on the SCA Technical Repair Committee and was Vice Chairman 1983-1990 and Chairman 1990-1993.

Prior to joining CMI, Mr. Wardwell served as an Engineering Duty Officer in the U.S. Navy. In August 1982, he retired with the rank of Captain after 27 years of service, his last position was Commanding officer, U.S. Navy Engineering Duty Officer School, Mare Island. In this position, he trained Navy Engineering Duty Officers at their entrance into the field and again at mid-career.

Previously, Mr. Wardwell served as Commanding Officer, Supervisor of Shipbuilding San Francisco (1978-1981). He was in charge of 300 Government employees and administered a $120 million annual budget for ship repairs in the private sector. In addition, Mr. Wardwell served as Special Project Officer NAVSEA 07 for the first private sector overhauls of FF-1052 Class ships in San Francisco. As Assistant Repair Officer for all cruiser destroyer and as Planning and Estimating officer, Long Beach Naval Shipyard (1974-1977), Mr. Wardwell was responsible for all aspects of planning, estimating, and fiscal management at the shipyard. While serving as the Force Material Officer for Commander, Cruiser Destroyer Force, U.S. Pacific Fleet (1970-1974), Mr. Wardwell was responsible for the repair, overhaul, maintenance, and engineering operation of the 125 cruisers and destroyers of the Pacific Fleet. He also managed the repair budget for this fleet, working directly for the Two-Star Flag Officer Force Commander. Other positions included Planning and Design Officer, Supervisor of Shipbuilding, Bath, Maine, and three tours as Chief Engineer aboard DD and DDG Class ships.

Education: B.S., Maine Maritime Academy, 1958. Graduate study, Naval Postgraduate School, 1965. Senior Business Management, USC, Los Angeles, 1975. Accounting, Long Beach City College, 1977.

EXPERIENCE INCLUDING SHIP DESIGN AND CONSTRUCTION/RENOVATION/CONVERSION

Mr. Wardwell has extensive experience in this area both in the Navy and as a senior private shipyard manager. Specifics:

1963 I was a Navy Lt. assigned as Chief Engineer and Manager of the Fleet Rehabilitation and Modernization (FRAM) program for a DD-710 class destroyer. Project required 10 months and several million dollars to totally renovate the ship.

1968-1970 as a Senior Lt. Commander I was the Planning and Design Officer at Bath Iron Works shipyard. During this period I was responsible for the planning and design function of the Navy for construction of three guided missile destroyers built and delivered to the German Navy. Concurrently, we planned and converted five guided missile cruisers in the Navy AAW Modernization program. This project took 13 months per ship and placed all new electronics and weapons systems on board the ship requiring extensive structural changes.

1970-1974 Assigned as Force Material Officer U.S. Navy Cruiser/Destroyer Force, U.S. Pacific Fleet,125 Combatant Ships. I managed the repair,overhaul,maintenance and engineering operation of the Force. This included planning,budgeting,scheduling and overseeing the work at both Public and Private shipyards. I managed a staff of 50 highly technical senior enlisted men and Officers overseeing the work. I was a Commander U.S Navy during this period.

1974-1977 Assigned to Long Beach Navel Shipyard employing 7200 personnel performing overhaul and major repairs on navy ships. The first years assignment was production ssupervisor for the work on 8 combatant ships with one year production periods. The following two years I served as the planning and estimating officer for all shipyard assigned work including Air Craft Carriers.

1977-78 I was assigned as a special Navy Project Officer to assist Triple A, a shipyard in San Francisco in planning and production work associated with the first private sector FF-1052 renovations of three ships. Each project was approximately twenty (20) million dollars and 15 months in duration.

1978-81 I was promoted to Captain, U.S. Navy, and assigned as the Commanding Officer of the Office of Supervisor of Shipbuilding, Conversion and Repair, San Francisco. As such I managed a staff of 250 civilian engineers and technicians. We managed approximately 130 million dollars of annual overhaul and modernization ship work and ammunition and tanker type ships.

1981-82 I was assigned as the Commanding Officer of the Navy's Engineering Duty Officer's School. All new Engineering Duty Officers and all mid-grade Engineering Officers attended this school. I should point out that I was an Engineering Duty Officer from 1967 until my retirement in 1982.

In 1982 I entered the private sector shipyard business as the first General Manager of a new shipyard in San Diego which subsequently became Continental Maritime of San Diego. In 1984 I was promoted to Corporate V.P. for Operations and later became concurrently the General Manager of the San Francisco shipyard. In 1987 I returned to the San Diego shipyard and undertook expanded Service Engineering Industries corporate duties. I left Service Engineering in January 1994.

In 1995 I joined American Management Systems Corporation and worked daily for 15 months with the Avondale Shipyard and Bath Iron Works Shipyard Production, Planning and Scheduling personnel in developing and documenting the building plans for the LPD-17 construction program.

NATIONALLY ACKNOWLEDGED PROFFESSIONAL REPUTATION IN THE FIELD OF MARINE DESIGN AND CONSTRUCTION/RENOVATION

I served as a Director of the Shipbuilding Council of America (SCA) from 1986 through 1994. I served on the Technical Repair Committee during this period and was Committee Co-chairman 1988-1990 and Chairman 1991-1993.

I served as a Director of the San Diego Ship Repair Association from its inception in 1982 through 1994. I was Vice President of the Association from 1982-1990, then President 1990 to 1993. San Diego was the first of what is now five local associations around the country in major ports. I assisted three of the organizations in getting set up with bylaws, etc., They now meet in Washington D.C. twice a year and join ranks with the Shipbuilding Council of America to provide a stronger unified position on Industry needs.

EXHIBIT 2

MIL-STD-769B ■ 9999911 0339650 406 ■

9-29-01

MIL-STD-769B(SHIPS)
3 January 1966

SUPERSEDING
MIL-STD-769A(SHIPS)
23 April 1963

MILITARY STANDARD

THERMAL INSULATION REQUIREMENTS FOR MACHINERY AND PIPING

852

FSC 5640

MIL-STD-769B(SHIPS)
3 January 1966

DEPARTMENT OF THE NAVY

BUREAU OF SHIPS

WASHINGTON, D. C. 20360

Thermal Insulation Requirements for Machinery and Piping
MIL-STD-769B(SHIPS)

1. This standard has been approved by the Bureau of Ships, and is published to establish the requirements for thermal insulation for machinery and piping on Naval ships.

2. Use of this standard by activities under the cognizance of the Bureau of Ships shall be mandatory effective on the date of issue.

3. Recommended corrections, additions, or deletions including improvements in the procedures described herein, and changes in this standard which can result in less costly installations without sacrificing the level of quality desired should be addressed to the Chief, Bureau of Ships, Department of the Navy, Washington, D. C. 20360.

CONTENTS

TABLES

1. SCOPE

1.1 The purpose of this standard is to amplify the general requirements for insulation of piping, machinery, uptakes, and mechanical equipment covered in the General Specifications for Ships of the U. S. Navy or in ships specifications.

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein:

SPECIFICATIONS

FEDERAL --

T-T-931	- Twine, Cotton, Mattress.
HH-C-466	- Cloth, Glass, Coated (for Membrane Waterproofing and Built-Up Roofing).
HH-I-551	- Insulation Block, Pipe Covering and Boards, Thermal (Cellular Glass).
QQ-S-775	- Steel Sheets, Zinc-Coated.
QQ-W-343	- Wire - Electrical And Non-Electrical, Copper (Uninsulated).
QQ-W-390	- Wire, Nickel-Chromium-Iron Alloy.
SS-C-192	- Cement, Portland.
SS-C-466	- Cloth, Thread, and Tape, Asbestos.
TT-P-26	- Paint, Interior, White and Tints, Fire-Retardant.
TT-P-320	- Pigment, Aluminum; Powder and Paste, for Paint.
UU-T-106	- Tape, Pressure-Sensitive Adhesive, Masking, Paper.

MILITARY

MIL-C-788	- Cloth, Brattice, Cotton, Fire-Resistant.
MIL-I-2781	- Insulation, Pipe, Thermal.
MIL-I-2818	- Insulation Blanket, Thermal, Fibrous Mineral.
MIL-I-2819	- Insulation Block, Thermal.
MIL-C-2861	- Cement, Insulation, High-Temperature.
MIL-C-2908	- Cements, Finishing, Insulation.
MIL-A-3316	- Adhesives, Fire-Resistant, Thermal Insulation.
MIL-P-15006	- Paper, Sheathing, Fire-Resistant and Water-Repellent.
MIL-I-15091	- Insulation Felt, Thermal, Asbestos Fiber.
MIL-A-15199	- Adhesive, Asbestos Cloth to Pipe, Insulation.
MIL-P-15280	- Plastic Foam, Unicellular, Sheet and Tubular Form, Elastomeric.
MIL-P-15328	- Primer, Pretreatment (Formula No. 117 for Metals).
MIL-I-15349	- Insulation Tape, Thermal.
MIL-I-15475	- Insulation Felt, Thermal, Fibrous Glass, Semirigid.
MIL-I-16411	- Insulation Felt, Thermal, Glass Fiber (for Temperatures Up To 1200 Degrees F.)
MIL-A-18065	- Adhesives, High Initial Bond.
MIL-B-19564	- Bedding Compound, Thermal Insulation Pipe Covering.
MIL-C-19565	- Coating Compounds, Thermal Insulation Pipe Covering - Fire-, and Water-Resistant, Vapor-Barrier and Weather-Resistant.
MIL-F-20077	- Felt, Asbestos, Roll.
MIL-C-20079	- Cloth, Glass, Tape, Textile, Glass: and Thread, Glass.
MIL-I-22023	- Insulation Felt, Thermal and Sound Absorbing Felt, Fibrous Glass, Flexible.
MIL-I-22344	- Insulation, Pipe, Thermal, Fibrous Glass.
MIL-C-22395	- Compound, End Sealing, Thermal Insulation Pipe Covering - Fire-, Water-, And Weather-Resistant.
MIL-I-23128	- Insulation Blanket, Thermal, Refractory Fiber, Flexible.

BUREAU OF SHIPS

General Specifications for Ships of the U. S. Navy.

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DRAWINGS

BUREAU OF SHIPS
5000-S5103-841336 - Piping, Boiler Soot Blower, Typical Installation.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. - The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated the issue in effect on date of invitation for bids shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASTM - A167 - Specification for Corrosion-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
ASTM - 209 - Specification for Seamless Carbon-Molybdenum Alloy-Steel Boiler and Superheater tubes.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Penn.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. GENERAL REQUIREMENTS

3.1 General requirements such as definitions, basic applications, and reasons for insulating are covered in the General Specifications for Ships of the U. S. Navy or in ships specifications, Section 9390-2. Thermal insulation and acoustic absorptive treatment of compartments, ventilating ducts and trunks are covered in the appropriate sections of the above specifications.

3.2 Minor deviations in installation which meet the intent of the requirements specified herein may be approved by the cognizant Supervisor of Shipbuilding, U. S. Naval shipyard, or the Bureau of Ships. (A copy of all such changes shall be forwarded to the Bureau of Ships, Code 648).

4. MATERIALS AND THICKNESSES

4.1 Minimum thicknesses. - Tables 1 to 10, inclusive specify materials for insulation and lagging and the minimum acceptable thicknesses for the temperature ranges listed.

4.2 Special conditions. - The following special conditions supplement or modify the selection of materials or thicknesses specified, when applicable:

(a) The insulation thickness on soot blower piping between the root valve and the soot blower heads shall be reduced from that indicated for a system normally operating at the same temperature as follows:

(1) Where double layer insulation is used, only the inner (high temperature) insulation thickness layer need be installed.
(2) Where the insulation consists of a single uniform thickness layer, only one-half the total specified thickness need be installed.

(b) The insulation thickness for hot water systems operating at a normal maximum temperature of 150°F. may be 1/2 inch thick for pipe sizes up to 3/4 inch i.p.s., in accordance with MIL-I-2781.

(c) Where double layer construction consisting of two classes of insulation is specified in table II, the higher temperature class insulation may be furnished in a uniform single thickness equal to the total thickness specified, if single layer construction is considered desirable. Where single layer construction is used in lieu of double layer construction, suitable expansion joints to permit thermal movement of the piping, without opening of insulation joints, must be provided.

(d) Where considered desirable, higher temperature classes of insulation may be used where lower temperature classes are specified provided they are satisfactory in all other respects (e.g. where class b of MIL-I-2781 is specified, class d or e may be used or where class c is specified, class f may be used).
(e) Compounded type insulation conforming to MIL-I-2781, grade I, (calcium silicate only) or cellular glass insulation conforming to HH-I-551 shall be used on hot piping requiring insulation that will be exposed to the weather, and shall conform to the thicknesses specified in table 10.
(f) Elastomeric foamed plastic insulation, MIL-P-15280, may be used for machinery and equipment applications up to 180°F; 1/2 inch minimum thickness.
(g) Where HOT SURFACE insulation thicknesses are not specified, such as for refractory fiber insulation felt, MIL-I-23128, and special applications, the following shall be used as a guide in determining acceptable thicknesses.

Insulation thickness shall be sufficient to:

(1) Reduce the insulation surface temperature to 150°F or below, where personnel can normally contact these surfaces.
(2) Prevent the transfer of heat to surrounding areas which would be objectionable to personnel or adversely affect other components.
(3) Prevent transfer of heat which would otherwise reduce the efficiency or effectiveness of the system or component.

(h) Where operating temperatures are normally between 125°F. and 150°F. and the omission of insulation will not adversely affect operating efficiency, non-metallic lagging only may be applied where necessary, to protect personnel from contact with hot metal surfaces.

4.3 Adhesives.- The following adhesives shall be used for fastening cloth and tape lagging:

Type of lagging	Specification
Asbestos	MIL-A-15199[1/] or MIL-A-3316, type II
Fibrous glass	MIL-A-3316, type I or type II

[1/] Not applicable for cementing to fibrous-glass insulation.

4.4 Finishing cements.- Where finishing cement is specified any of the following materials are acceptable subject to any material limitations for the proposed application:

(a) Finishing cement, MIL-C-2908, type II.
(b) High-temperature insulating cement, MIL-C-2861, when used under asbestos cloth.
(c) A mixture of 80 percent high-temperature insulating cement, MIL-C-2861, and 20 percent portland cement, SS-C-192.

4.5 Metal lagging.- Where metal lagging is required, any of the following materials are acceptable, except for uptake applications (see 6.1.4):

Sheet material	Specification	Nominal thickness Inch
Hot-dipped galvanized steel	QQ-S-775	0.014
Aluminum	ASTM 209, Alloy 6061	.030
Corrosion-resistant steel (CRES)	ASTM A167, AISI type 304	.014

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5. RE-USABLE COVERS

5.1 Hot-surface insulation covers.- In order to insure that the pipe covering will not interfere with the servicing of a takedown joint where a re-usable cover is installed, the permanent insulation shall stop short of the takedown joint and a short removable and re-usable section of insulation shall be installed between the permanent insulation and the takedown joint. The insulation joint formed by the permanent and re-usable sections may be square, or at an angle of 45 degrees; the joint, however, shall be tight, without any gaps between the two sections and shall incorporate means to prevent dislodging the insulation sections. Re-usable covers are not required on systems insulated with elastomeric foamed plastic insulation (MIL-P-15280).

5.2 Construction.- For sizes larger then 2 inches i.p.s., valve bonnets and valves having takedown joints at the ends shall be fitted with re-usable covers such that the bonnet joint may be removed independently of the valve covering. Valves 2 inches i.p.s. and under shall be fitted with separate covers as indicated above, or covers of a one-piece design such that they may be wrapped around the entire valve body and clipped or otherwise secured just below the handwheel.

5.3 Fabrication, piping components.- For piping components except as otherwise specified, any one of the following methods of fabrication is acceptable:

5.3.1 Covers may be made in two halves of thermal insulating felt enclosed in asbestos cloth. Each half cover shall be sewn and quilted with wire-inserted asbestos yarn conforming to SS-C-466, form II, (for machine sewing, if desired, this yarn may be constructed with the three monel wires twisted together first, and the three asbestos threads twisted around the outside of the wire) or fastened with mechanical stapling in a manner to provide a uniform thickness, strength and rigidity.

5.3.1.1 Covers for use at temperatures of 850°F. and below shall be filled with insulation felt (see table I). Wire-inserted asbestos cloth, SS-C-466, grade AAA-M, shall be used on the inside surface of covers for valves larger than 2 inches i.p.s. For valves 2 inches i.p.s. and smaller, grade AAA shall be used on inside surface of covers. For 500°F. and below, asbestos cloth, SS-C-466, grade AA, shall be used on outside surface of covers; grade AAA cloth shall be used above 500°F.

Table I - Schedule of approved insulation and lagging materials. 1/

Service	Temperature Range (°F.)	Pipe and Tubing		Valves and Fittings		Flange Joints		Machinery	
		Insulation	Lagging	Insulation	Lagging	Insulation	Lagging	Insulation	Lagging
Gases Steam Hot water Oil	125 to 1200	MIL-I-2781 MIL-I-15349 (750°F. Max.) MIL-I-22344 (370°F. Max.) MIL-P-15280 (180°F. Max.)	SS-C-466 MIL-C-20079	MIL-I-2781 MIL-I-2819 MIL-I-16411 MIL-I-15091, type A MIL-C-2861, MIL-I-22344 (370°F. Max.) MIL-P-15280 (180°F. Max.) MIL-I-23128	SS-C-466 MIL-C-20079	MIL-I-2781 MIL-I-2819 MIL-I-16411 MIL-I-15091, Type A MIL-C-2861 MIL-I-22344 (370°F. Max.) MIL-P-15280 (180°F. Max.) MIL-I-23128	SS-C-466 MIL-C-20079	MIL-I-2819 MIL-I-16411 MIL-I-15091, type A MIL-I-2818 MIL-C-2861 MIL-I-22023 (370°F. Max.) MIL-I-23128 MIL-P-15280 (180°F. Max.)	SS-C-466 MIL-C-20079
Cold water Chilled Water	28 to 99	MIL-I-15091 MIL-I-2781 MIL-I-22344 MIL-P-15280 HH-I-551	SS-C-466 MIL-C-20079 MIL-P-15006 MIL-C-788	MIL-I-15091 MIL-I-2781 MIL-I-22344 MIL-I-2819 MIL-P-15280 HH-I-551	SS-C-466 MIL-C-20079 MIL-P-15006 MIL-C-788	MIL-I-15091 MIL-I-2781 MIL-I-22344 MIL-I-2819 MIL-P-15280 HH-I-551	SS-C-466 MIL-C-20079 MIL-P-15006 MIL-C-788	MIL-I-15091 MIL-I-22023 MIL-I-2819 MIL-P-15280 HH-I-551	SS-C-466 MIL-C-20079 MIL-P-15006 MIL-C-788
Refrigerant	-20 to 60	HH-I-551 MIL-P-15280	SS-C-466 MIL-C-20079 MIL-C-788	HH-I-551 MIL-P-15280	SS-C-466 MIL-C-20079 MIL-C-788	HH-I-551 MIL-P-15280	SS-C-466 MIL-C-20079 MIL-C-788	HH-I-551 MIL-P-15280	SS-C-466 MIL-C-20079 MIL-C-788

1/ Additional materials are covered in 4.5 (metal lagging); 6.1.4 (boiler uptakes); 6.2 (securing antisweat insulation); 6.4.1 (weather deck hot piping).

Table II - Insulation thicknesses for hot piping, compounded and fibrous conforming to MIL-I-2781

Pipe size (inches i.p.s.)	Temperature range (degrees F.)	Class 1/		Nominal thickness (inches)		
		Inner layer	Outer layer	Inner layer	Outer layer	Total
1/2, 1-1/2	125-388	b, c	--	1	--	1
	389-500	b, c	--	2	--	2
	501-750	c, d	--	2	--	2
	751-950	e, f	--	2	--	2
	951-1050	e, f	b, c	2	1-1/2	3-1/2
2, 2-1/2	125-338	b, c	--	1-1/2	--	1-1/2
	339-388	b, c	--	2	--	2
	389-500	b, c	--	3	--	3
	501-750	c, d	--	3	--	3
		c, d	b, c	1-1/2	1-1/2	3
	751-900	e, f	b, c	1-1/2	1-1/2	3
	901-1050	e, f	b, c	2	1-1/2	3-1/2
3 through 4-/12	125-338	b, c	--	1-1/2	--	1-1/2
	339-388	b, c	--	2	--	2
	389-500	b, c	--	3	--	3
	501-750	c, d	--	3	--	3
		c, d	b, c	1-1/2	2	3-1/2
	751-900	e, f	b, c	1-1/2	2	3-1/2
	901-950	e, f	b, c	2	1-1/2	3-1/2
	951-1050	e, f	b, c	2-1/2	1-1/2	4
5, 6	125-338	b, c	--	1-1/2	--	1-1/2
	339-388	b, c	--	2	--	2
	389-500	b, c	--	3	--	3
	501-750	c, d	--	3	--	3
		c, d	b, c	1-1/2	2	3-1/2
	751-900	e, f	b, c	1-1/2	2	3-1/2
	901-950	e, f	b, c	2	1-1/2	3-1/2
	951-1050	e, f	b, c	3	2	5
7	125-338	b, c	--	1-1/2	--	1-1/2
	339-388	b, c	--	2-1/2	--	2-1/2
	389-500	b, c	--	3	--	3
	501-750	c, d	--	4	--	4
		c, d	b, c	1-1/2	2	3-1/2
	751-900	e, f	b, c	1-1/2	2	3-1/2
	901-950	e, f	b, c	2	2	4
	951-1050	e, f	b, c	3	2	5
8 and larger	125-338	b, c	--	1-1/2	--	1-1/2
	339-388	b, c	--	2-1/2	--	2-1/2
	389-500	b, c	--	3	--	3
	501-750	c, d	--	4	--	4
		c, d	b, c	2	2	4
	751-900	e, f	b, c	2	2	4
	901-950	e, f	b, c	2-1/2	2	4-1/2
	951-1050	e, f	b, c	3	2	5

1/ Does not include finishing cement.

Table III - Thickness of insulation conforming to MIL-P-15280 and MIL-I-22344, for hot piping.

Temperature range (°F.)	Specification	Thickness
		Inch
125 to 180	MIL-P-15280 or MIL-I-22344	1/2
181 to 250	MIL-I-22344	1/2
251 to 300	MIL-I-22344	3/4
301 to 370	MIL-I-22344	1

Table IV - Thickness of insulating tape conforming to MIL-I-15349, for 1/4 to 3/4 inch size hot piping.

Temperature range (°F.)	Pipe size	Nominal thickness
		inch
125 to 250	1/4, 3/8	3/8
251 to 750	1/4, 3/8	7/8
125 to 250	1/2, 3/4	3/4
251 to 388	1/2, 3/4	1

Table V - Thickness[1/] of insulating materials for hot surfaces of machinery and equipment up to 850°F.

Temperature range (°F.)	Nominal Thickness (inches)		
	Glass fiber felt MIL-I-16411, Type II Refractory Fiber Blanket MIL-I-23128 Grade A	Asbestos felt MIL-I-15091 Insulation Block MIL-I-2818 Mineral Fiber Blanket MIL-I-2818 Glass Fiber Felt MIL-I-16411 Type I	Insulating cement MIL-C-2861
125 - 338	1	1 1/2	1 1/2
339 - 388	1 1/2	2 1/2	2 1/2
389 - 500	2	3	3
501 - 750	2 1/2	3 1/2	4
751 - 850	3	4 1/2	5

[1/] Does not include finishing cement.

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Table VI - Thickness[1/] of insulating materials for hot surfaces of machinery and equipment over 850°F.

Temperature range (°F.)	Thickness (inches)				
	Single felt material	Combination of two felt materials			Block
	MIL-I-16411 Type II MIL-I-23128 Grade A	Inner layer MIL-I-16411 Type I or II	Outer layer MIL-I-15091 Type A	Total	MIL-I-2819
851-900	4	2	3	5	4 1/2
951-1050	4	2	3	5	5
1051-1200					

1/ Does not include finishing cement.

Table VII - Thickness of refrigerant insulation for piping.

Pipe size (inches)	Temperature range (°F.)	Cellular glass HH-I-551 Nominal 1/ thickness (inches)		Plastic foam, MIL-P-15280 thickness, (inches)	
Up to 1-1/4	-20 to -1	2-1/4	1-1/2*	1-1/2	1*
	0 to 40	2	1-1/4*	1	3/4*
1-1/2 to 2-1/2	-20 to -1	2-1/2	1-3/4*	1-1/2	1
	0 to 40	2-1/4	1-1/2*	1	3/4*
3 to 5	-20 to -1	3	2*	1-1/2	1*
	0 to 40	2-3/4	1-3/4*	1	3/4*

1/ By nominal thickness is meant a thickness which is approximate and should only be used as a guide in determining actual thickness requirements.
* Thickness for application in air-conditioned spaces only.

Table VIII - Thickness of refrigerant insulation for machinery and equipment (exclusive of vapor barrier).

Temperature range (°F.)	Thickness (inches)			
	Foam plastic MIL-P-15280		Cellular glass, HH-I-551	
0 to 35	3	1*	5	1-1/2*

*Thickness for application in air conditioned spaces only.

Table IX - Thickness of antisweat insulation (exclusive of vapor barrier).

Temperature range (°F.)	Machinery and equipment			Piping		
	Material specification	Thickness (inches)		Material specification	Thickness (inches)	
28 to 99	MIL-I-15091 MIL-I-2819 HH-I-551	1-1/2	3/4*	MIL-I-15091 MIL-I-2781 MIL-I-2819 HH-I-551	1	1/2*
	MIL-I-22023	1	1/2*			
	MIL-P-15280	3/4	1/2*	MIL-P-15280 MIL-I-22344	3/4	1/2*

* Thickness for application in air-conditioned spaces only.

Table X - Nominal thicknesses of insulation for weather deck hot piping.

Pipe size (inches i.p.s.)	Calcium silicate, MIL-I-2781 Cellular glass, HH-I-551
	Inches
1/4 to 3	1-1/2
3-1/2 to 6	2
Over 6	2-1/2

5.3.1.2 Covers for use at temperatures above 850°F. shall have filling consisting of inner layers of fiber-glass felt, MIL-I-16411, or refractory fiber felt, MIL-I-23128, and outer layers of asbestos felt, and shall be covered on the inside surface and on the ends with nickel-chromium alloy wire mesh, QQ-W-390 (or wire-inserted asbestos cloth, SS-C-466, grade AAA-M, for services up to 950°F.) and on the outside surface with grade AAA asbestos cloth. Asbestos roll felt, MIL-F-20077 1/8 inch thick, may be inserted between the asbestos felt and the asbestos cloth if considered necessary to retain the cylindrical shape of the cover.

5.3.1.3 Hard asbestos millboard, 1/4 inch thick, enclosed in asbestos cloth of the type used on the outside cover, shall be sewn on ends of covers for strength and rigidity. When a more flexible cover is desired, such as when space limitation would not permit installation of the more rigid type, the millboard will not be required. When the flange diameter is larger than the outside diameter of the adjacent pipe covering, build-up pieces made of asbestos felt encased in asbestos cloth, SS-C-466, grade AAA shall be stitched to inside of cover. Halves of covers shall be fastened together by 1/16-inch diameter galvanized, or other corrosion resistant, wire rope laced through brass or galvanized steel hooks or rings, or fastened by brass snap fasteners. Fastenings shall be securely attached to cloth lagging.

5.3.1.4 Preformed fibrous glass valve or fitting covers may be used when temperatures are in the 125-370°F. range. These shall be of the same thickness as the adjacent pipe covering. Such covers, when used, shall be lagged independently of the pipe covering and in a manner which will facilitate removal and replacement.

5.3.2 Covers may be made of segments of block insulation or preformed pipe insulation, having the same thickness as that on the adjacent piping. Blocks shall be securely wired to frames of 1/2 inch square mesh, Number 18 gage (0.049-inch diameter) galvanized steel wire. Wire mesh frames inside and outside of blocks shall have ends bent over and joints secured with Number 18 gage black annealed iron wire woven through the mesh. Insulating cement compatible with the material of the blocks shall be troweled smoothly over all surfaces of the wire mesh. Asbestos roll felt may be used to build up covers when the flange diameter is larger than the outside diameter of the adjacent pipe covering. Cover shall be tightly and smoothly lagged to envelop the outside and ends. For temperatures of 500°F. and below asbestos cloth lagging conforming to SS-C-466, grade AA, shall be used; grade AAA cloth shall be used above 500°F. Lagging may

be cemented or sewn on, except ends of covers shall always be sewn. Where double layer insulation is used the two sections of the cover shall be fitted together with a scarfed joint. Such joints shall be straight and true to reduce heat loss. Bands, eyelets, or locks of galvanized steel, or lacing with hooks, rings, washers, and wire shall be used to secure the covers.

5.3.3 When installing the above covers, spaces between inner surfaces of covers for flanges and other irregular surfaces shall be filled with pieces of insulation felt. Asbestos felt may be used when temperatures are 850°F. or less. Fibrous glass felt in accordance with MIL-I-16411 or MIL-I-23128, grade A may be used when temperatures are 1200°F. or less. Felt shall be packed loosely enough to preserve air cell structure and tightly enough to prevent air circulation.

5.4 Fabrication, machinery and equipment.- For re-usable covers for machinery and equipment, either of the following methods of fabrication is acceptable.

5.4.1 Covers may be similar to the flexible asbestos felt or fiber-glass felt type described for piping components.

5.4.2 Covers may be made in sections formed of insulating block held together with wire and adhesive cement, covered with 1/2-inch thickness of finishing cement, and lagged. Lacing with hooks, rings, washers, and wire, or brass snap fasteners shall be used to secure the covers.

5.4.3 Semi-removable turbine casing flange covers may be installed as an alternate for removable covers specified above. The permanent insulation shall be run to the casing flange allowing bolt removal space. The flange and bolts are then covered with asbestos cloth, wire inserted asbestos cloth or incolen wire mesh, as required by operating temperature, which shall be secured to the bolts with wire. The flange may now be insulated with fibrous glass felt MIL-I-16411, asbestos felt MIL-I-15091, mineral wool felt MIL-I-2818 or insulation block MIL-I-2819 to the required thickness and shape; the insulation is then lagged with asbestos cloth. This cloth shall be carried over the outer edge of the permanent insulation and secured with adhesive. The semi-removable cover shall then be sealed and painted.

6. INSTALLATION

6.1 Hot surface insulation.-

6.1.1 Pipe and tubing.- Each layer of molded insulation shall be installed with joints butted together. Where two layers are used all joints shall be staggered. Not less than three fastenings shall be used for securing each 3-foot section of insulation. Fastening shall be Number 18 gage minimum (0.049-inch diameter) annealed black or hot-dipped galvanized iron wire or flat steel bands. Except as otherwise specified, lagging shall be installed over the insulation.

6.1.1.1 The installation of soot blower piping insulation shall be in accordance with drawing 5000-S5103-841336.

6.1.2 Piping components.- For valves, fittings, and accessories, welded and brazed fittings including unions may be insulated and lagged similarly to adjacent piping.

6.1.2.1 Block, felt, blanket insulating materials, or molded pipe insulation secured with hot-dipped galvanized iron wire, may be used. When insulating felts are used above 850°F. the inner layer shall be fiber-glass felt conforming to MIL-I-16411 or refractory fiber felt, MIL-I-23128. Galvanized iron wire netting, Number 18 gage minimum (0.049-inch diameter), shall be spread over the insulating material and secured with wire. Insulating cement shall be used to fill all crevices, smooth all surfaces, and completely cover the wire netting. A 1/2-inch thickness of finishing cement shall then be applied. Insulating material shall be the same thickness as that on adjacent piping.

6.1.2.2 For components 3-1/2 inch i.p.s. and smaller, insulating cement only conforming to MIL-C-2861, may be applied to a thickness 1/2 inch less than the adjacent pipe insulation. A 1/2 inch thickness of finishing cement shall be applied over the insulating cement.

6.1.2.3 Re-usable covers shall be fitted where required.

6.1.3 Machinery and equipment.- For machinery and equipment, block, felt, or blanket insulating materials of the required thickness shall be secured with hot-dipped galvanized iron wire. Galvanized iron wire netting 1-inch mesh and Number 18 gage minimum (0.049-inch diameter) shall be spread over the surface and secured by wire. Insulating cement shall be used to fill all crevices, smooth all surfaces, and completely cover the wire netting.

6.1.3.1 When no insulating cement has been specified, a 1/2-inch thickness of finishing cement shall be applied.

6.1.3.2 When an insulating cement has been specified it shall be applied in successive layers, 1/2 inch to 1 inch in thickness, until the total thickness specified has been reached. Wire netting, similar to that used for covering the insulating materials, shall be installed between layers. A 1/2-inch thickness of finishing cement shall be applied over the last layer of insulating cement.

6.1.3.3 Lagging shall be installed over finishing cement. Re-usable covers shall be installed where required.

6.1.3.4 Clips, hooks, or other fastenings for securing insulation or lagging shall not be brazed or welded to nonferrous parts of distilling plants or deaerating feed tanks.

6.1.4 Boiler uptakes.- For boiler uptakes the thermal insulation shall be 2 inches thick. Either mineral wool felt, MIL-I-2818, or fibrous glass sheet, MIL-I-15475, may be used. If acoustic absorptive treatment is found to be necessary to decrease the noise level the insulation thickness shall be increased accordingly.

6.1.4.1 Metal lagging for uptakes shall be galvanized sheet steel conforming to QQ-S-775, not less than 1/32 inch thick.

6.1.4.2 Insulation and lagging is not required on uptakes above the weather deck, except where the transfer of heat, to spaces adjacent to the uptake area, would be objectional.

6.2 Antisweat insulation (cold and chilled water service).-

6.2.1 Molded pipe covering, cellular glass, water repellent asbestos felt, or fibrous glass insulation shall be secured with Number 18 gage minimum (0.049 inch diameter) hot-dipped galvanized iron wire, soft annealed copper wire, QQ-W-343, wire inserted asbestos yarn, or glass thread, MIL-C-20079, spirally wound on 1-inch centers. One layer of water repellent and flameproof sheathing paper, MIL-P-15006, shall be wrapped tightly around the insulation and secured with cotton twine, T-T-931, glass thread, MIL-C-20079, or 1-inch wide tape, UU-T-106. All joints of the paper shall be lapped and sealed with adhesive cement, MIL-A-3316, type II. The compatible lagging shall then be installed and completely covered with vapor barrier compound, MIL-C-19565, type II. The water repellent paper may be eliminated on cellular glass where the insulation surface is suitable for the effective application of vapor barrier compound MIL-C-19565.

6.2.2 Application of a vapor barrier is not required on elastomeric foamed plastic insulation, MIL-P-15280, nor is lagging required except in areas where such insulation would be subject to damage.

6.3 Refrigerant insulation.-

6.3.1 Cellular glass insulation shall be coated on all surfaces with vapor barrier compound, MIL-C-19565, type II at the time of installation. Insulation shall be installed with staggered end joints. On horizontal pipes the longitudinal joints shall be at the top and bottom. Insulation shall be secured with number 18 gage minimum (0.049 inch diameter) copper-covered steel wire or 1 inch wide tape, UU-T-106, on 9 inch centers. The compatible lagging shall then be installed and completely covered with vapor barrier compound, MIL-C-19565, type II.

6.3.2 Elastomeric foamed plastic, MIL-P-15280 may be applied in 1/4 inch minimum thickness layers as necessary to build up the required thickness (type II, form 1 or 2). All longitudinal and butt joints shall be staggered. All joints and lagging, if required (see 6.2.2), shall be secured with adhesive cement in accordance with paragraph 3.7 of MIL-P-15280.

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6.4 Weather deck hot piping insulation. -

6.4.1 Calcium silicate or cellular glass insulation for piping exposed to the weather shall be installed as follows:

(a) Preliminary preparation of piping.

(1) All surfaces to be clean, dry, and free of scale and grease.
(2) Fittings, valves, flanges, pipe supporting clamp, and at least 3 inches of adjacent pipe shall be painted as follows: Apply one coat pretreatment formula 117, MIL-C-15328. After this coat dries, apply two coats of aluminum paint made by mixing two pounds of aluminum paste, TT-P-320, type II, class B, with each gallon of phenolic varnish.

(b) Installation on pipes.

(1) The bore, butt ends, and longitudinal joint surfaces of cellular glass insulating material shall be coated not more than 1/16 inch thick with commercial bedding compound, in accordance with MIL-B-19564, at time of installation. Bedding compound is not required with calcium silicate pipe covering.
(2) Longitudinal joints on horizontal piping shall be on top and bottom of pipe.
(3) Insulation shall be secured tightly to pipe with 1/2-inch wide U. S. Standard 22 gage galvanized steel bands on 9-inch centers. Steel bands shall be placed over a layer of fibrous glass tape, MIL-C-20079, class c, which has been dipped in the commercial finishing compound in accordance with MIL-C-19565 type I. Steel bands shall be wrapped with a layer of masking tape, UU-T-106, type II.
(4) Completely coat insulation with commercial finishing compound, in accordance with MIL-C-19565, using about 2 gallons per 100 square feet. Wrap on tightly one layer of open weave fibrous glass cloth, HH-C-466, or knitted fibrous glass tape, MIL-C-20079, and then apply another coating of above-specified finishing compound, using about 4 gallons per 100 square feet. After this coat has set apply a second coat of finishing compound using the same quantities.
(5) Where insulation is stopped off on the piping, sufficient mineral wool, MIL-I-2818, shall be tightly tied in place with galvanized iron wire over a heavy coating of the above-specified commercial bedding compound, to provide a tapered portion from insulation surface to pipe surface. The ends of the insulation shall be tapered at a 30-degree angle with the pipe. The tapered ends of the insulation shall be smoothed with insulation cement in accordance with MIL-C-2861. The cement covered tapered ends, after drying thoroughly, shall be coated with approximately a 1/8 inch thick tack coat of end sealing compound in accordance with MIL-C-22395. The sealer compound shall extend onto the pipe for at least 3 inches. A single layer of grade D, class 2 asbestos cloth lagging, in accordance with SS-C-466, shall be applied over the insulation and secured at longitudinal lap joint with type II adhesive cement in accordance with MIL-C-3316. The asbestos lagging cloth shall be tailored to fit the contour of the ends of the insulation by cutting and removing wedge-shaped sections of the cloth. The remaining ends of the cloth shall be embedded in the tack coating of sealer compound and shall be attached to the pipe with a single 1/2 inch wide galvanized steel band. A 3/16 inch layer (approximately) of sealer compound shall be troweled to a smooth finish over the cloth covered ends of the assembly. A smooth finish may be obtained by brush coating or hand rubbing the sealer compound with a suitable solvent. After 72 hours of drying at ambient temperature, the asbestos cloth of the assembly shall be given two brush coats of water- and weather-resistant coating compound in accordance with MIL-C-19565. The waterproofing compound shall extend halfway down the tapered ends of the assembly. The waterproofing compound shall be air dried 24 hours between applications.

(c) Installation on fittings, flanges, and valves.

(1) Before applying flange insulation weather deck piping shall be tested and secured in the following manner: After specified tests are completed, weather deck piping shall be subjected to alternate periods of full operating pressure, allowing pipe to come to maximum temperature; and then to zero gage pressure allowing pipe to cool to ambient temperature.

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These cycles shall be repeated a sufficient number of times, tightening and adjusting flanges where necessary until no leaks can be detected.

(2) Fittings, flanges, and valve covers shall be ship-fabricated from sections of molded pipe covering or cellular glass block cemented together with adhesive cement, MIL-A-18065, class 1.

(3) Permanent covers for fittings and valves shall be fitted snugly to fittings and adjacent pipe covering using the same materials and methods as outlined for pipe covering. Voids between insulation and fitting shall be filled with tightly packed mineral wool, MIL-I-2818.

(4) Where specified, rigid-type portable flange covers shall extend over the adjacent pipe covering 1-1/2 times the thickness of the insulation. The two halves of the cover should be coated and lagged separately, using the same materials and procedure as outlined for pipe covering. The galvanized steel bands used to secure the two halves together and to the adjacent pipe covering shall be applied over the lagging and then coated with the above-specified finishing compound.

(d) Installation around supports and hangers.

(1) Remove only enough insulation from butt edges to provide a snug fit around support brackets or hanger rods. Fill all voids between insulation and support with tightly packed mineral wool, MIL-I-2818, to within 1/4 inch from insulation surface. Fill remainder of space with end sealing compound in accordance with MIL-C-22395 overlapping generously both the support member and the adjacent insulation. Lag and coat with same method and materials as adjacent piping.

6.5 Metal lagging. - Metal lagging shall be installed with lap joints, secured with hardened self-tapping screws or metal bands. Joints shall be arranged in a manner which will facilitate run-off of impinging liquids.

6.6 Painting. - All cloth and tape laggings shall be painted after installation with one coat of fire-retardant white paint, TT-P-26, if necessary for appearance. Elastomeric foamed plastic insulation MIL-P-15280 shall not be painted except where necessary for appearance. (For material and application requirements, see Section 9190-1 of the General Specifications for Ships of the U.S. Navy or ships specifications.)

7. NOTES

(Copies of this standard for military use may be obtained as indicated in the foreword to, or the general provisions of, the Index of Military Specifications and Standards.)

Both the title and the identifying number should be stipulated when requesting copies of Military Standards.

Preparing activity:
Navy - SH
(Project 5640-N031SI

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EXHIBIT 3

MIL-STD-755
31 August 1961

JAN 12 1962

MILITARY STANDARD

LABELS CONTAINING SYMBOLS FOR PACKAGES AND CONTAINERS FOR HAZARDOUS INDUSTRIAL CHEMICALS AND MATERIALS

FSC 7690

ARMED FORCES SUPPLY SUPPORT CENTER

WASHINGTON 25, D. C.

Labels Containing Symbols for Packages and Containers
For Hazardous Industrial Chemicals and Materials

MIL-STD-755

1. This standard has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force, effective 31 August 1961.

2. Recommended corrections, additions, or deletions should be addressed to the Standardization Division, Armed Forces Supply Support Center, Washington 25, D. C.

FOREWORD

The purpose of this standard is to establish a uniform design for symbols to warn users of the potential dangers involved with the use of the material in containers.

Exceptions. The symbols of this standard are not intended to cover or conflict with the following conditions, regulations or categories of material:

1. Materials being held in store for reshipment. (Unless the Commanding Officer of the activity directs labeling of such material.)

2. Chemicals or drugs used or dispensed by medical department pharmacies.

3. Chemicals used by clinical or chemical laboratories. (The exempted laboratories will be those designated by the departments, bureaus, offices and the Marine Corps.)

4. It has been determined that there are adequate regulations governing the marking of containers for explosives, gasoline, fuels and compressed gases.

CONTENTS

FIGURES

1. SCOPE

1.1 **Scope.** This standard covers design, colors, stocked sizes and requirements for danger symbols to be affixed to packages and containers containing hazardous industrial chemicals and materials.

1.2 **Classification.** Symbols for indicating hazardous materials are placed into the following seven (7) general classifications:

Class 1 — Fire Hazard.
Class 2 — Toxic and Fire Hazard.
Class 3 — Toxic.
Class 4 — Poisonous.
Class 5 — Corrosive.
Class 6 — Radiation Hazard.
Class 7 — Fire Hazard — Oxidizer.

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on date of invitations for bids form a part of this standard:

STANDARDS

FED. STD. No. 595 — Colors.

SPECIFICATIONS

MIL-L-19868 — Labels, Paper, Pressure-Sensitive Adhesive (For Hazardous Industrial Chemicals and Materials).

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. DEFINITIONS

(Not Applicable)

4. GENERAL REQUIREMENTS

4.1 Labels with the symbols covered by this standard are considered to be the best method for marking containers of hazardous industrial chemicals and materials. It is recommended that military activities use Specification MIL-L-19868 for the procurement of labels.

4.2 **Utilization of symbols.** The following is a guide to the type of materials and conditions that would govern the use of the symbols covered by this standard.

4.2.1 *Class 1 — Fire Hazard (Flammable).* Any material known as flammable or combustible.

4.2.2 *Class 2 — Toxic and Fire Hazard.* Any material which presents a combined hazard due to its flammability (Class 1) and its toxicity (Class 3).

4.2.3 *Class 3 — Toxic.* Any material which may be harmful to persons coming in contact with the material or vapor, dust, fume or mist given off from the material during utilization or processing. The injurious effects may arise from one exposure (acute) or from repeated exposures over a long period of time (chronic). The mode of entry into the body may be either through the respiratory tract or the skin. The oral route of entry is an uncommon route in the usual environmental exposure.

4.2.4 *Class 4 — Poisonous.* A poison is commonly understood to be a material which will be harmful or fatal when taken into the body through the oral route in relatively small amounts.

4.2.5 *Class 5 — Corrosive.* Agents which upon contact with tissues of the body surface will cause injury or destruction of those tissues.

4.2.6 *Class 6 — Radioactive Hazard.* Hazardous materials or chemicals which emit alpha, beta, gamma or neutron radiation or which may give off dust, fumes, gases or vapors emitting these radiations.

4.2.7 *Class 7 — Fire Hazard — Oxidizer.* Any material which readily furnishes oxygen for combustion and fire producers which react explosively or with evolution of heat in contact with many other materials.

5. DETAILED REQUIREMENTS

5.1 **Size of symbols.** Symbols shall be the following sizes as specified:

2½ inches by 2½ inches.
4 inches by 4 inches.

5.1.1 *Tolerance.* A tolerance of plus or minus 1/32 inch will be permitted in the specified size of the symbols.

5.2 **Color.** The colors indicated for the symbols in Figures 1 through 7 shall acceptably match in shade the applicable color of Federal Standard No. 595, as follows:

Color	*Class*
Black	17038
Red	11105
White	17875
Yellow	13538
Magenta	17142
Green	14187
Brown	10080

5.3 **Marking and design.** Each symbol shall conform to the applicable markings and design, as indicated in Figures 1 through 7.

Custodians:
Army—QMC
Navy—S&A
Air Force—MOA

Preparing activity:
Navy—S&A

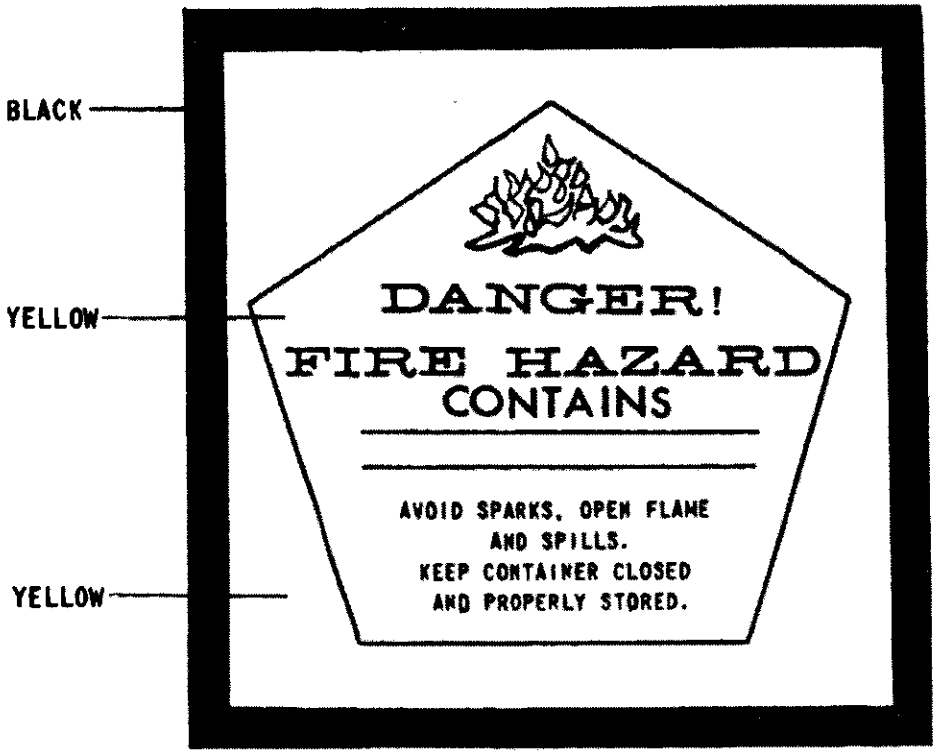

ILLUSTRATION-RED LETTERING - BLACK

FIGURE 1. CLASS 1 - FIRE HAZARD SYMBOL

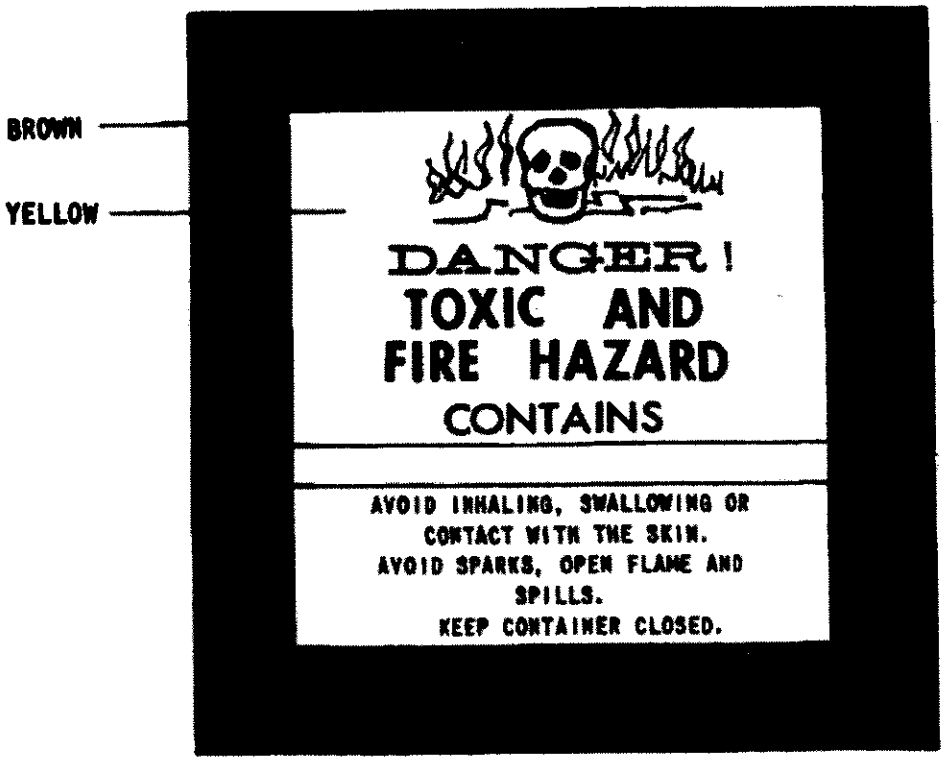

ILLUSTRATION-RED LETTERING - BLACK

FIGURE 2. CLASS 2 - TOXIC AND FIRE HAZARD SYMBOL

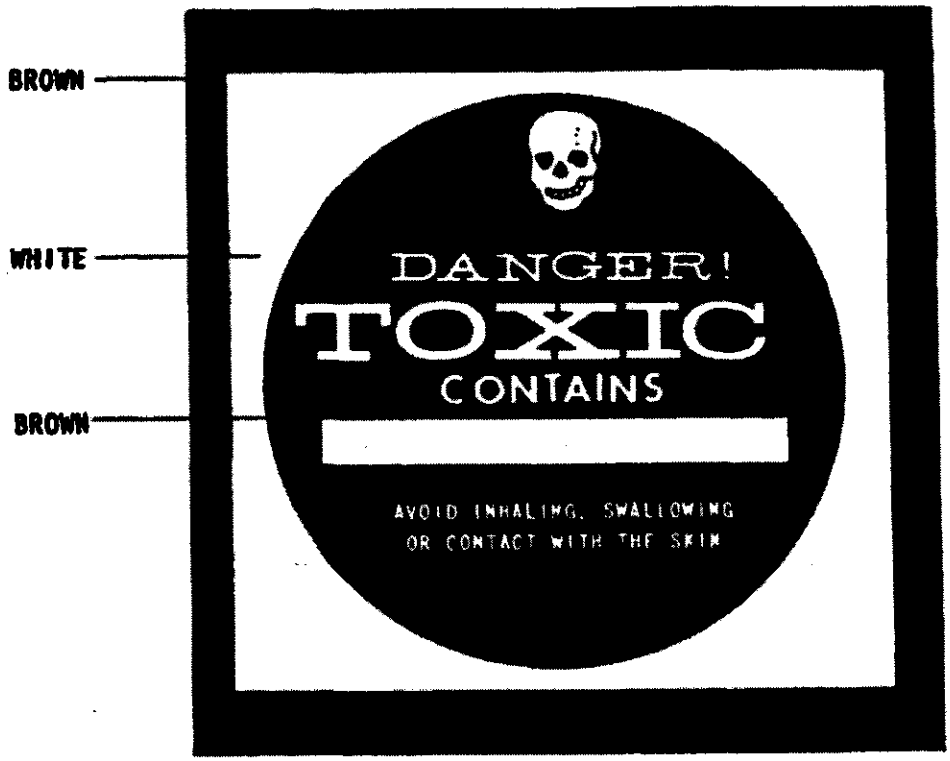

ILLUSTRATION AND LETTERING - WHITE

FIGURE 3. CLASS 3 - TOXIC SYMBOL

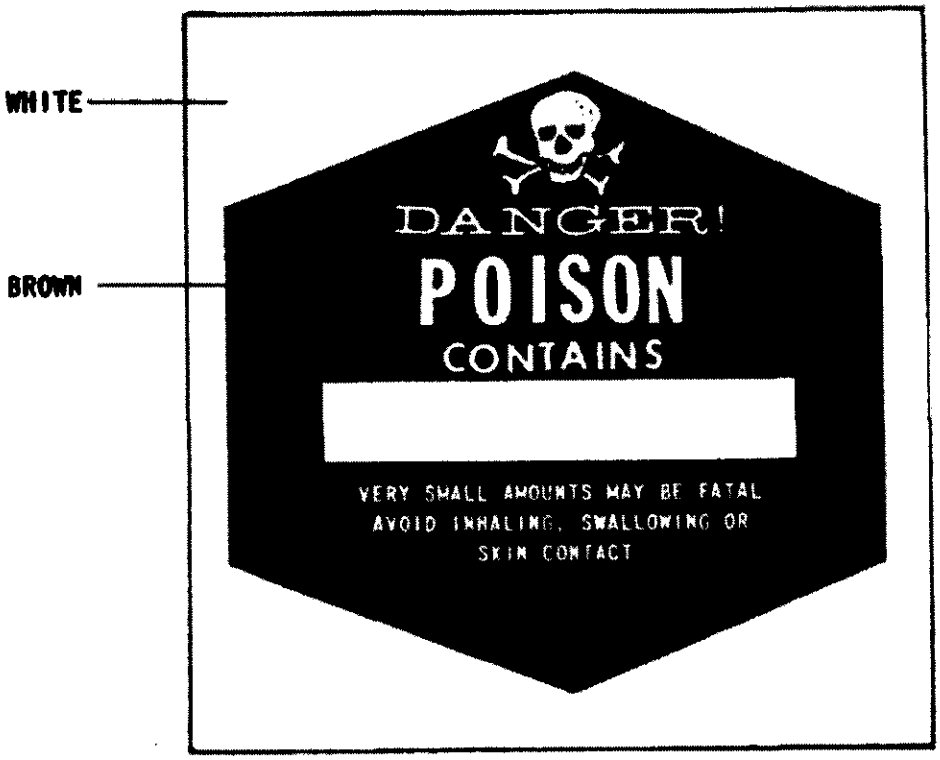

ILLUSTRATION AND LETTERING - WHITE

FIGURE 4. CLASS 4 - POISONOUS SYMBOL

ILLUSTRATION AND LETTERING - BLACK

FIGURE 5. CLASS 5 - CORROSIVE SYMBOL

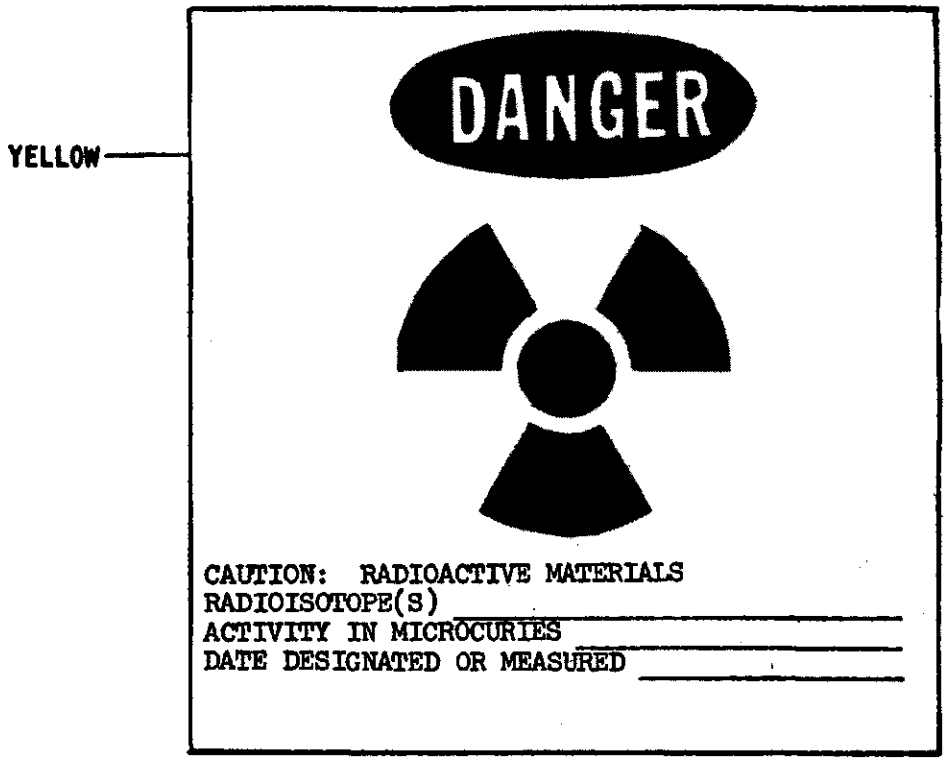

ILLUSTRATION - MAGENTA EXCEPT THE WORD "DANGER"—WHITE

FIGURE 6. CLASS 6 - RADIATION HAZARD SYMBOL

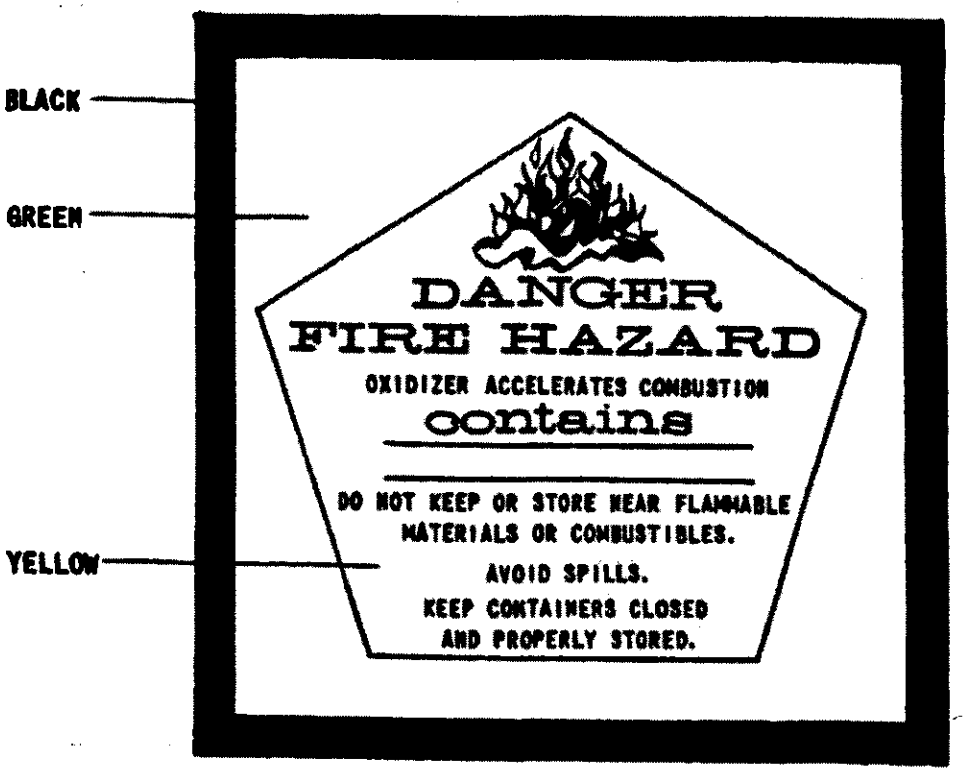

ILLUSTRATION-RED LETTERING - BLACK

FIGURE 7. CLASS 7 - FIRE HAZARD - OXIDIZER

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